MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
Permitting and Compliance Division
Waste and Underground Tank Management Bureau
Solid Waste Section
PO Box 200901
Helena, MT 59620-0901

ENVIRONMENTAL ASSESSMENT

SOLID WASTE SECTION ROLES AND RESPONSIBILITIES:

The Department of Environmental Quality (DEQ) is responsible for ensuring activities proposed under the Solid Waste Management Act, the Septage Disposal Licensure Act, and the Motor Vehicle Disposal & Recycling Act are in compliance with current regulations. The Solid Waste Section (SWS) is a part of DEQ's Permitting and Compliance Division, Waste and Underground Tank Management Bureau. The Solid Waste Management Act (75-10-201, MCA) and the Administrative Rules of Montana (ARM), Title 17, Chapter 50 provide the necessary authority for the SWS to license and regulate solid waste management systems (SWMS) in the state of Montana.

SECTION 1.0 – PROJECT DESCRIPTION:

Mr. Carl P. Tange (applicant) doing business as BAC Disposal, submitted a SWMS license application to DEQ's SWS for the licensure of a Class II landfill to manage oilfield solid waste. The proposed landfill is located in the W ½ of the SW ¼ of the NW ¼ of Section 3, the SE ¼ of the NE ¼ of Section 4, and the SE ¼ of the SW ¼ of the NE ¼ of Section 4, Township 35 North, Range 53 East, Montana Principal Meridian, Sheridan County, Montana (Figure 1.1). At the present time, the property is used intermittently for crop production and livestock grazing. The proposed landfill will be developed in three separate phases with a total waste disposal capacity of 1,085,600 cubic yards (yds^3) over an expected 15-year life.

Purpose of the Environmental Assessment:

In accordance with 75-1-102, MCA, the Montana Environmental Policy Act (MEPA) is procedural and requires the "adequate review of state actions in order to ensure that environmental attributes are fully considered by the legislature in enacting laws to fulfill constitutional obligations; and the public is informed of the anticipated impacts in Montana of potential state actions." According to MEPA, environmental assessments (EAs) are the procedural documents that communicate the process agencies follow in their decision-making. An EA does not result in a certain decision, but rather serves to identify the potential effect of a state action within the confines of existing laws and rules governing such proposed activities so that agencies make balanced decisions. The MEPA process does not provide regulatory authority beyond the authority explicitly provided in existing statute.

The Solid Waste Management Act and associated administrative rules establish the minimum requirements for the design and operation of SWMS's. The EA is the mechanism that DEQ uses to: 1) Disclose whether a proposed site meets the minimum requirements for compliance with the current laws and rules; 2) Assist the public in understanding the state SWMS regulations as they pertain to licensing solid waste facilities; 3) Identify and discuss the potential environmental effects of the proposed site if it is approved and becomes operational; 4) Discuss actions taken by the applicant and the enforceable measures and conditions designed to mitigate the effects identified by DEQ during the review of the application; and 5) Seek public input to ensure DEQ has identified the substantive environmental impacts associated with the proposed landfill.

Benefits and Purpose of the Proposal

The safe licensed disposal of oilfield exploration and production (E&P) wastes provides the best option for avoiding the illegal disposal of such wastes in coulees, or other out-of-sight or remote areas. Onsite burial of E&P wastes at drilling locations has been a widely practiced and previously accepted method of disposal in past decades but is increasingly scrutinized by landowners and is viewed as a high liability disposal option by generators. At the present time, there are only three landfills in Montana that are approved to accept specific oilfield E&P wastes; two of which are municipal solid waste disposal facilities (one in southeastern Montana, the other in north central Montana); the remaining is a stand alone E&P waste disposal facility in southeastern Montana. Licensure of this facility will provide oilfield exploration and service companies in the region an additional option for waste management in northeastern Montana. Licensure will also result in the creation of at least two additional jobs in the area.

The main objective of the proposal is to provide an environmentally sound and legal option for the disposal of oilfield solid wastes to the oil and gas exploration and production companies in the area. Oil and gas E&P solid wastes will be hauled to the facility by the drilling company operators, oilfield service companies, and licensed haulers. The proposed facility will be a privately owned and operated landfill that will not be open to the public. By so doing, the potential rapid reduction in the capacity at publicly owned landfills in the region can also be averted.

Site Location:

The proposed landfill is located approximately 5 miles south of Outlook, Montana, on 44.2 acres of property owned by Carl P. Tange. The landfill site is located in the W ½ of the SW ¼ of the NW ¼ of Section 3, the SE ¼ of the NE ¼ of Section 4, and the SE ¼ of the SW ¼ of the NE ¼ of Section 4,, Township 35 North, Range 53 East, Montana Principal Meridian, Sheridan County, Montana (Figure 1.1). Of the 44.2 acres proposed for the solid waste management facility, only 14.58 acres are proposed for active landfilling activities (Figure 1.2).

Figure 1.1: Location of Proposed Site

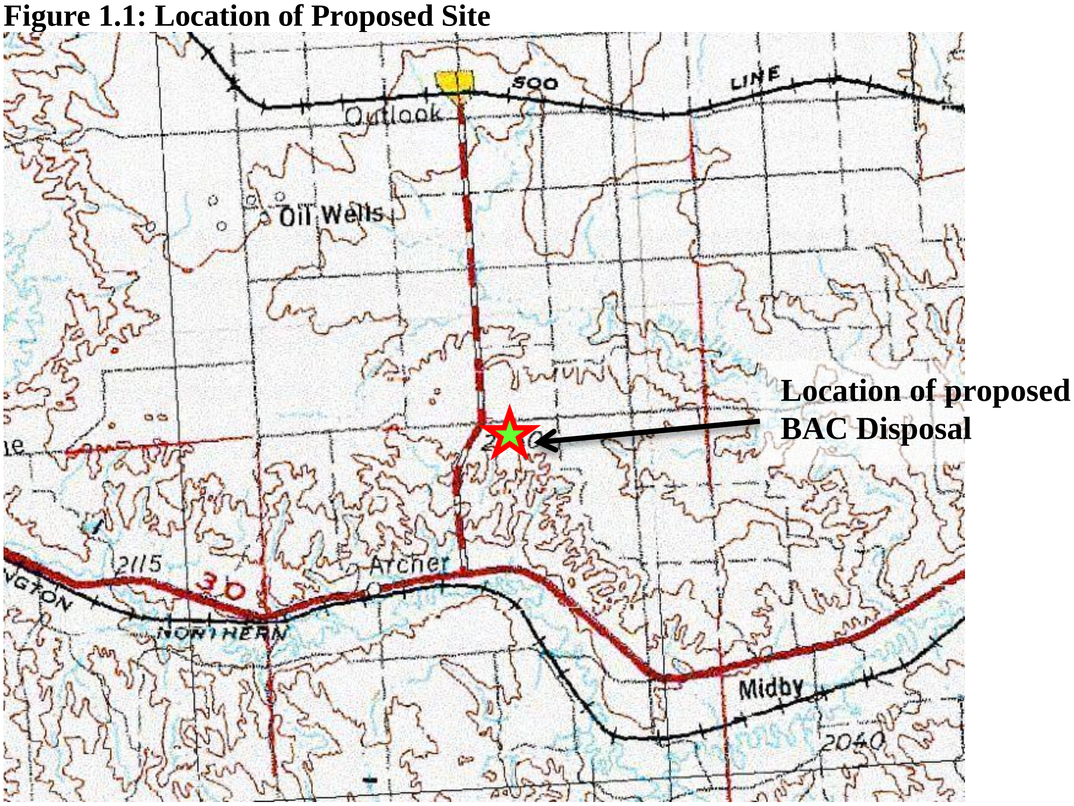
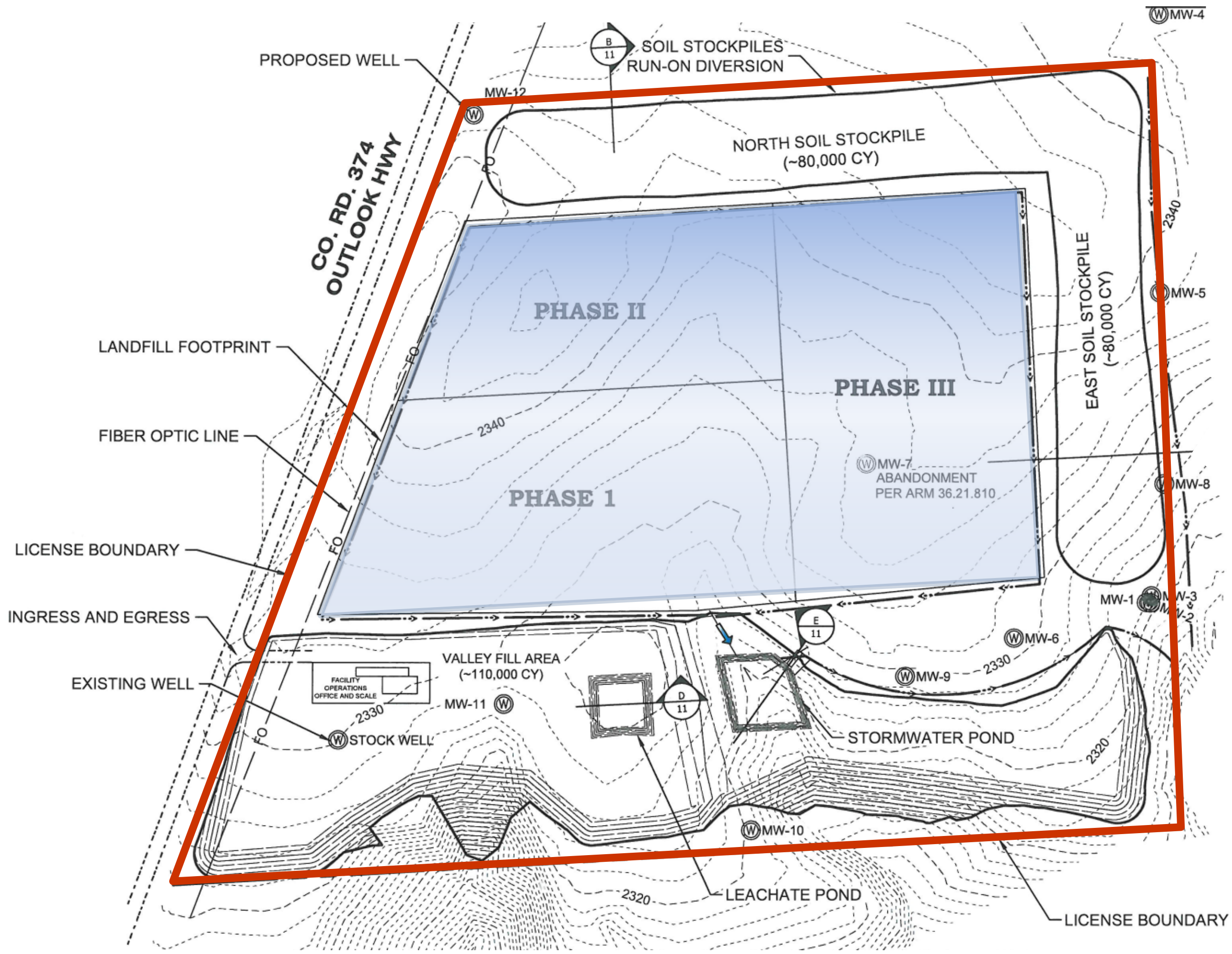


Figure 1.2: Landfill Site Plan
(*Source: WCEC Environmental Consultants, BAC Disposal Landfill Application, 2013***)**



Site Geography – Topography, Vegetation, and Climate:

The proposed landfill site is located in the Missouri Plateau Level IV ecoregion of the Northwestern Great Plains. The Northwestern Glaciated Plains ecoregion is a transitional region between the generally more level, moister, more agricultural Northern Glaciated Plains to the east and the generally more irregular, dryer, Northwestern Great Plains to the west and southwest. The western and southwestern boundary roughly coincides with the limits of continental glaciation. The area is characterized as mostly treeless with rolling hills and gravel covered benches that were modified by continental glaciation. Some areas in the region are subject to wind erosion, especially those areas that have been overgrazed.

The native vegetation is a mixed grass prairie consisting primarily of grama, needlegrass, and wheatgrass. Land use in the area is a mosaic of rangeland and farmland. Agriculture is found on the undissected gravel benches and in the alluvial soils of the area river valleys. Spring wheat, oats, hay, and barley are common crops.

The climate is typical of mid-continental regions, with long severe winters and hot summers. The climate summary provided as Table 1.1 shows that the average precipitation in the area ranges is 13 inches annually, with most of the precipitation occurring during the late spring and early summer months. The growing season averages 115 days.

Table 1.1: Climate Summary from Plentywood Montana Weather Station – ID No. 246586

PLENTYWOOD, MONTANA (246586)													
Period of Record Monthly Climate Summary													
Period of Record : 7/ 1/1906 to 3/31/2013													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (^oF)	22.8	30.2	42.6	58.6	69.3	78.1	84.2	84.2	74.4	58.7	38.4	26.5	55.7
Average Min. Temperature (^oF)	-1.9	5.9	16.8	28.8	39.7	49.3	53.8	51.2	40.7	28.6	15.3	3.5	27.7
Average Total Precipitation (in.)	0.40	0.30	0.48	0.89	1.84	2.73	2.13	1.56	1.19	0.75	0.44	0.31	13.00
Average Total SnowFall (in.)	5.8	3.2	3.3	1.3	0.1	0.0	0.0	0.0	0.1	1.0	3.5	4.1	22.6
Average Snow Depth (in.)	5	2	1	0	0	0	0	0	0	0	0	1	1

Landfill Design, Construction, Closure, and Post-Closure Care:

The design features and layout of the proposed BAC Disposal Landfill are depicted in Figure 1.2. The proposed facility consists of several components that include the scale, landfill office building, facility access road, interior roads, disposal units, groundwater monitoring wells, leachate collection and removal system, and storm water control features.

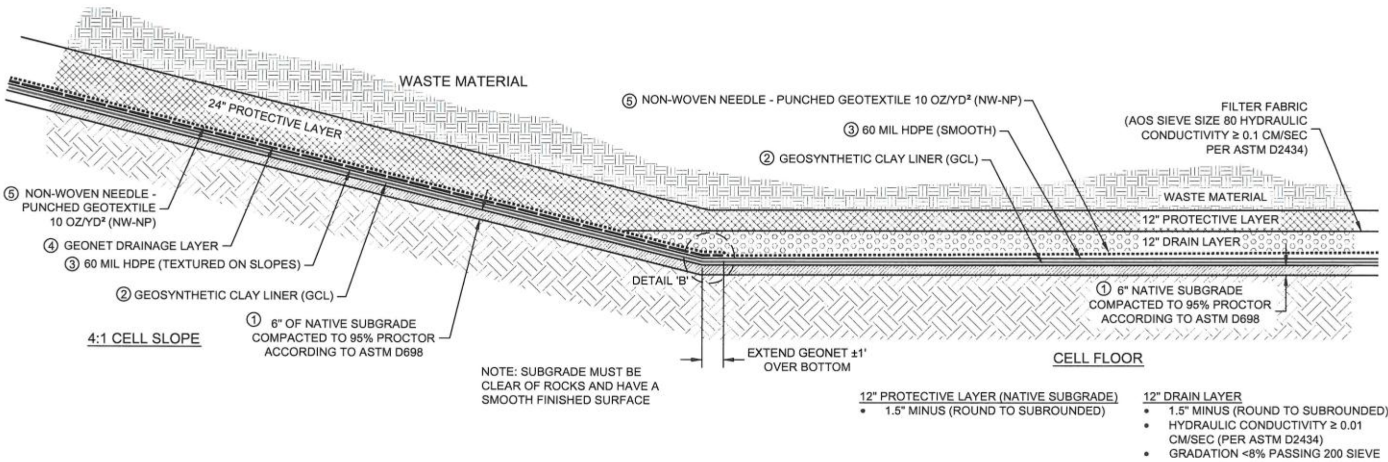
Liner Design and Alternative Liner Demonstration – According to Administrative Rules of Montana (ARM) 17.50.1204, a new Class II unit must be designed to protect groundwater from landfill contaminants. This can be accomplished by construction that meets the design criteria prescribed by the rules or by submitting an alternative liner demonstration that shows the design is protective of groundwater. The prescribed landfill design consists of a standard composite liner comprised of two components. The upper component must consist of a minimum 30-mil flexible membrane liner (FML); for an FML component that consists of high density polyethylene (HDPE), the HDPE must be at least 60-mil thick and must be installed in direct and uniform contact with the compacted soil component. The lower component must consist of at least a two-foot layer of compacted soil with a hydraulic conductivity of no more than 1×10^{-7} cm/sec. Hydraulic conductivity is a measure of the speed (rate or velocity) at which liquids flow through a material and depends upon how well the pores in the material are connected to transmit fluid. The hydraulic conductivity of the two-foot layer of compacted soil must be no more than $1.0x10^{-7}$ cm/sec; this means that any liquids passing through the clay would pass through at a rate of 0.0000001 cm/sec or 1.24157 inches per year.

Because the applicant proposed an alternative liner design for the disposal unit, the application included an Alternative Liner Design Demonstration (Demonstration) in accordance with the requirements of ARM 17.50.1204. The applicant's proposed design utilizes a composite liner comsisting of an engineered geosynthetic clay liner in place of the two-foot layer of compacted clay. As a result, the liner design consists of the following components, as shown in Figure 1.3, from the top to bottom:

- 60-mil flexible HDPE geomembrane
- Geosynthetic clay liner (GCL)
- 6-inch cushion soil layer

HDPE is a very low permeability synthetic membrane that is used to contain or control liquid and/or gas migration in an engineered project, structure, or system. HDPE pipe is often used to convey water or wastewater for municipal systems. In landfill construction, HDPE geomembrane liner is used as an impermeable barrier to prevent the contamination of soil and groundwater from chemicals in the waste.

Figure 1.3: Composite Liner Detail
(*Source: WCEC Environmental Consultants, BAC Disposal Landfill Application, 2013*)



Geosynthetic clay liners are used primarily for lining landfills. It is comprised of a layer of bentonite that is sandwiched between two layers of a woven felt-like fabric material. Bentonite is a clay that expands when wetted. The fabric material is stitched together to hold the bentonite in place when it expands. The lower the hydraulic conductivity of the clay, the more effective the GCL will be at retaining liquids inside the landfill. Although clay has a higher porosity than sand, the porosity in clay is due to the abundance of micropores, the openings between the individual clay particles; the porosity in sand is attributed to the macropores, the large pores between the individual sand grains. Liquids move slower through the micropores in bentonite clay due to the larger surface area and higher surface tension of each individual clay particle. Because bentonite is an expanding clay, it has a larger surface area than non-expanding clays. All clay particles will hold on to the individual water molecules because they have a higher surface tension than a grain of sand. This surface tension results in a lower hydraulic conductivity for clay as opposed to sand, thus making bentonite a more effective barrier for retaining liquids inside the landfill. The hydraulic conductivity of the manufactured GCL is 1.0×10^{-9} cm/sec; this value is 100 times lower than values reported for many compacted clay-rich soils. This means that any liquids passing through the clay would pass through at a rate of 0.000000001 cm/sec or 0.0124157 inches per year; 0.1862355 inches over 15 years; 0.37247 inches over 30 years.

Because the 60-mil HDPE liner meets the requirements for the FML component of the composite liner system (as described above), DEQ's evaluation of the Demonstration for the GCL as a replacement for the 2-foot compacted clay layer depends on the comparison of the performance of these components. This comparison is based upon the maximum saturated hydraulic conductivity (Ks) of each material. The maximum Ks is a measure of a saturated soil's ability to transmit water. As noted above, the Ks reported for manufactured GCL is 1.0×10^{-9} cm/s. According to ARM 17.50.1202(5), the maximum Ks required for the CCL is 1.0×10^{-7} cm/sec. The design analysis provided in the Demonstration was found complete based on generally accepted, state-of-the-practice technical documents that confirm that the proposed liner design is functionally equivalent to the standard composite liner defined by ARM 17.50.1202(5). The Demonstration shows that the use of the manufactured GCL exceeds the requirements of the 2-foot thick CCL over the life of the facility and the proposed liner design would perform as required when constructed beneath the waste disposal units at the BAC Disposal facility.

Landfill Unit Construction – The proposed liner system described above will be installed during landfill construction according to DEQ's approval and the manufacturer's guidelines for each component. Each component of the liner system will be tested for conformance with the design based on the Construction Quality Assurance and Construction Quality Control (CQA/CQC) Plan.

As depicted in Figure 1.2, a single landfill unit will be constructed in three phases within the 14.58-acre disposal footprint. The unit will be constructed with an average slope on the base liner of 2.5-percent towards the south collection trench; the liner side slopes will be constructed with 4:1 (Horizontal:Vertical) slopes. The average waste fill depth will be 110 feet. Utilization of the expected 1,279,000 yd^3 landfill capacity will provide for the disposal of at least 1,085,600 yds^3 of E&P waste.

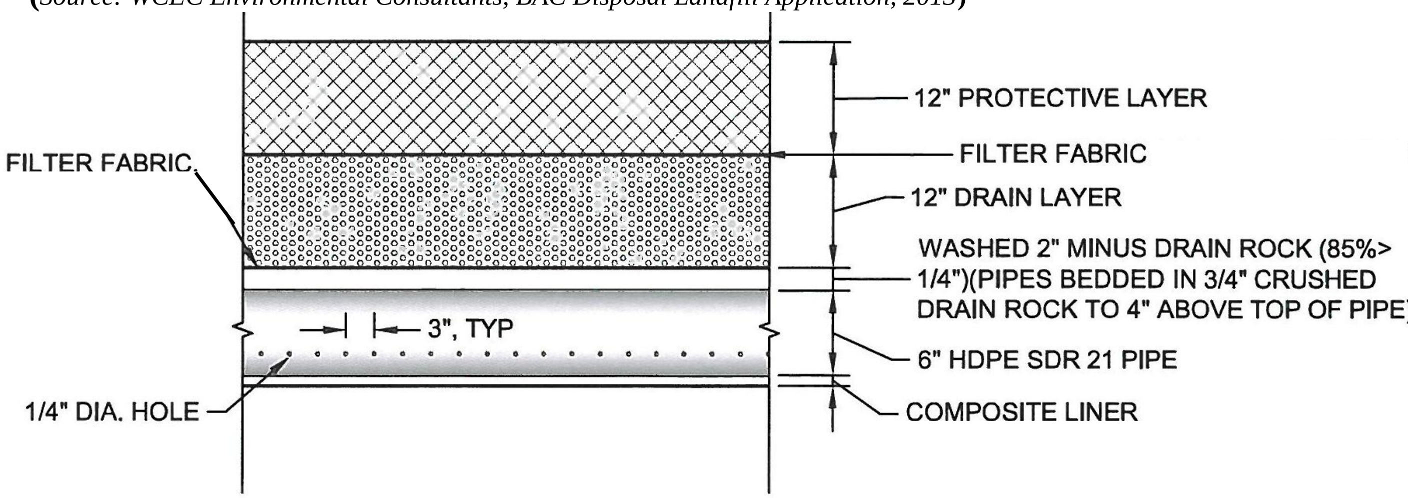
Excavation of the native soils beneath the landfill footprint will result in the removal of 300,000 yds^3 of soil that will be used as either the soil cushion layer or as a protective layer on top of the HDPE liner. Some of the material may also be stockpiled for later use as intermediate or final cover soil. Before the GCL is placed, the soil cushion layer will be wetted and rolled to compact it in a single lift to ensure that the GCL is laid down on a smooth surface. The GCL component will be placed over the smooth soil cushion layer with a 6-inch overlap on each side with granular bentonite at the seam; the HDPE liner will then be installed in direct and uniform contact with the GCL component with an 8-inch overlap on each side that is heat fusion welded at each edge.

Leachate Collection and Removal System and Leachate Pond - A leachate collection and removal system (LCRS) will be installed according to all CQA/CQC requirements and project plans approved by DEQ. The components of the LCRS, as shown in Figure 1.4, consist of the following from top to bottom:

- 12-inch soil protective layer
- Filter fabric
- 12-inch leachate collection drainage layer*
- Non-woven, needle-punched geotextile

* *geonet will be substituted on the 25% sloping side slopes*

Figure 1.4: Typical Section – Leachate Collection System Design
(*Source: WCEC Environmental Consultants, BAC Disposal Landfill Application, 2013***)**



All leachate will be collected over the base of the landfill within a 12-in thick gravel blanket that will drain southward into two 6-in perforated HDPE leachate collection pipes placed in a gravel-bedded trench along the southern toe of the Phase-I and Phase–III units. The collected leachate within the trench will flow at 1.2% grade to a gravel sump at the central south toe of the Phase-I unit, where the two laterals join with a horizontal 20-in slotted HDPE collector pipe. A 20-in solid HDPE riser pipe will join with the horizontal collector pipe and will be installed over the Phase-I south slope liner to provide access for pumping as necessary to comply with the maximum 1-ft leachate depth allowed over the liner. The lateral leachate pipes will rise up the side slopes from the collection trench and terminate into two cleanouts on the eastern and western margins of the landfill unit.

The leachate that is removed from the sump will be pumped to the leachate pond using a flexible pipe. Leachate will be managed in the leachate pond by evaporation. The leachate pond will be constructed with a composite liner from top to bottom as follows:

- 12-inch soil protective layer
- Non-woven 10-ounce needle-punched geotextile filter fabric
- 60-mil flexible HDPE liner
- Geosynthetic clay liner
- 6-inch cushion soil layer

The leachate pond's composite liner will be installed on the flat bottom and maximum 3:1 (Horizontal:Vertical) side slopes after the subgrade is adequately smoothed. The leachate pond composite liner components will be installed in a manner equivalent to the landfill base liner according to all CQA/CQC requirements and project plans approved by DEQ.

The leachate pond is designed to store up to 45,000-y^3 of leachate pumped from the landfill. If it becomes necessary, leachate may be recirculated back to the landfill unit and applied over the composite liner. The leachate pond has no outlet and leachate may not be released.

During the first year of operations, the leachate sump will be monitored on at least a semi-annual basis. Any liquids collected in the sump will be sampled and analyzed for the following list of constituents:

- Total RCRA Metals, including:
  - ❖ Arsenic, Cadmium, Chromium, Lead, Mercury, Selenium, Silver
- Benzene, Toluene, Ethylbenzene, and Xylene
- Extractable Petroleum Hydrocarbons
- Radionuclides, including:
  - ❖ Radium-226, Radium-228, Pb-210, U-238, Th-232

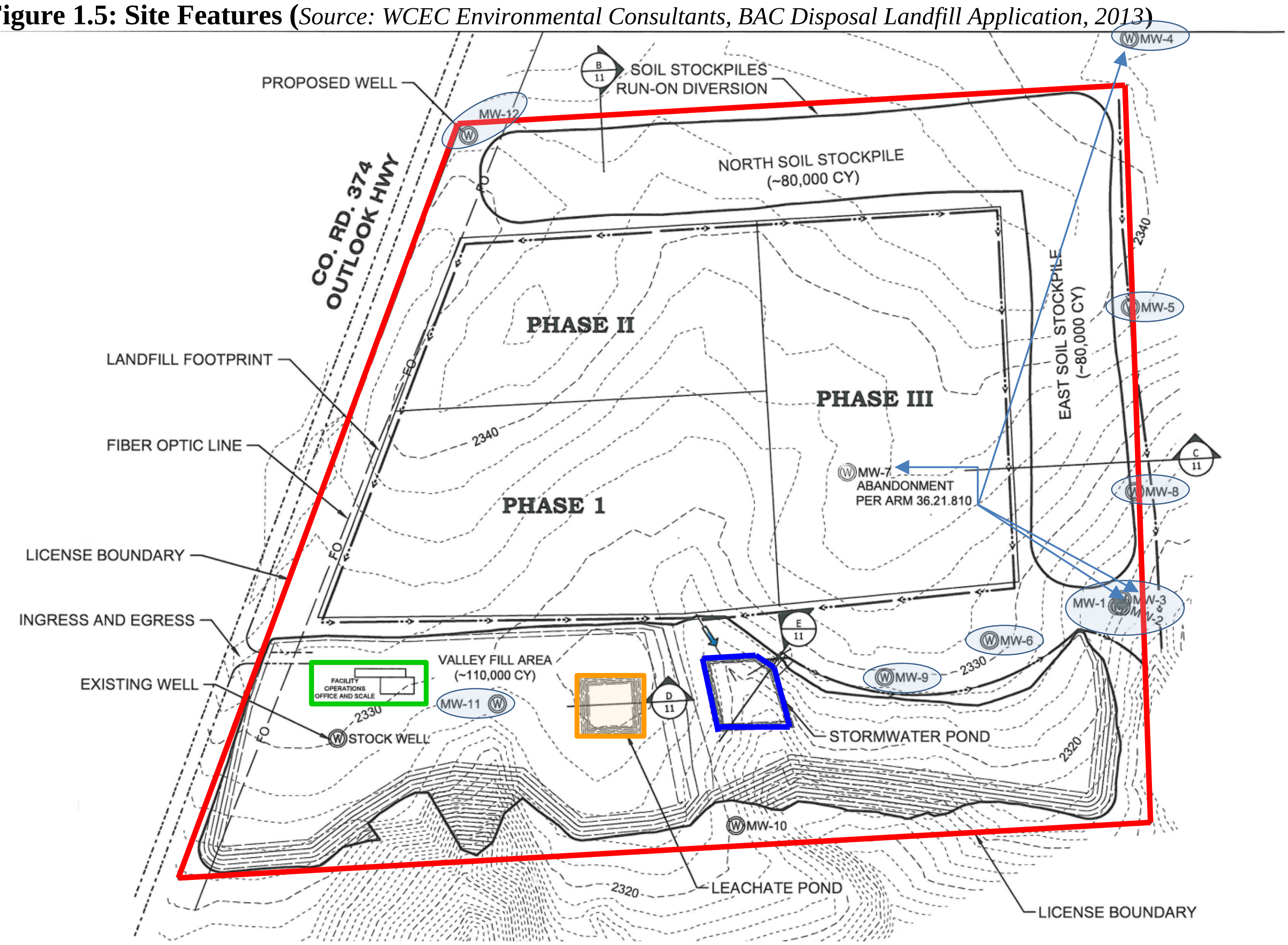
Any proposed demonstration for a site-specific waiver from the existing requirement for a permanent leachate removal system must be based on the amount of leachate generated and the contaminant concentrations resulting from the lab analyses after the first year of operations.

Scale and Office Building — The scale and office building will be located at the entrance to the facility on the west side of the site (Figure 1.5).

Soil Stockpiles — The topsoil removed during site development will be used to construct a berm on the northeast corner of the site within the licensed boundary. This berm will divert stormwater around the perimeter of the active landfill unit, as depicted in Figure 1.4, and will be seeded to prevent erosion of the stockpiled soils. The additional earthen-materials removed during excavation of each landfill unit will be stockpiled in the area of the subsequent unit and will be used as-needed for daily, intermediate, and final soil cover. Other best management practices (BMP's) or features, that may include erosion control mats, screens, wattles, or berms, will be used to control erosion from these stockpiles as needed. All runoff from soil stockpiles will be routed to the storm water pond, but BMP's (e.g. revegetation) may allow clean runoff from these areas to also be routed to the adjacent coulee.

Groundwater Monitoring Wells – The location of the proposed groundwater monitoring well network is shown on Figure 1.5. The monitoring well network will consist of eight monitoring wells, designated as MW-1, MW-5, MW-6, MW-8, MW-9, MW-10, MW-11, and MW-12. As shown on Figure 1.5, monitoring wells MW-2, -3, -4, and -7 installed during the initial site characterization efforts have been replaced by other wells and will be abandoned according to the procedures outlined by the Board of Water Well Contractors in ARM 36.21.810 - Abandonment. Proposed monitoring well MW-12 is located hydraulically upgradient of the landfill area and is expected to provide the necessary background groundwater quality data for the facility. The remaining wells in the monitoring network are located downgradient of the landfill area and will provide the necessary water quality data for groundwater flow in an easterly to southerly direction.

Figure 1.5: Site Features (*Source: WCEC Environmental Consultants, BAC Disposal Landfill Application, 2013***)**

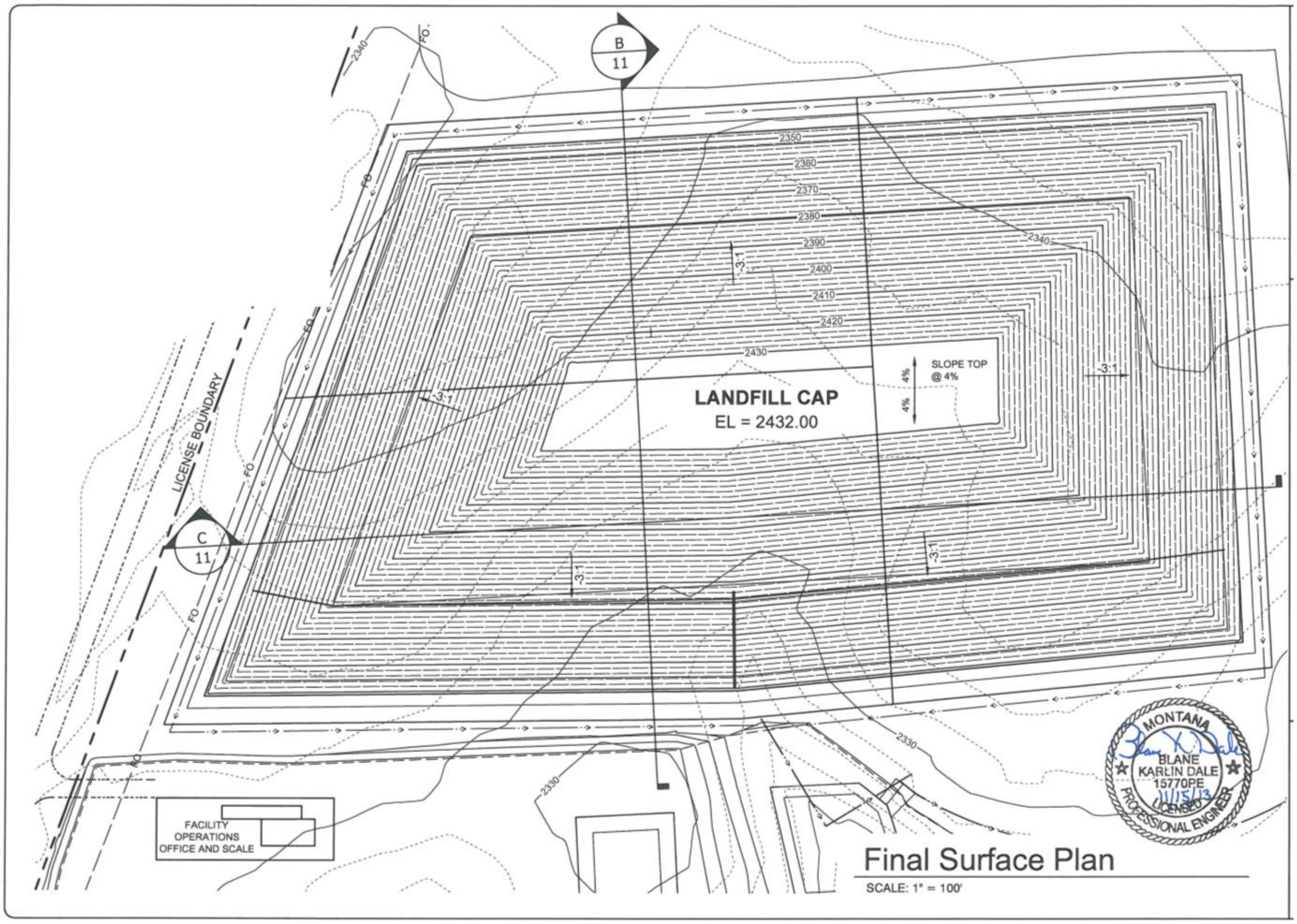


Final Closure — Once each of the three phased landfill units have been filled to final grade, the intermediate soil cover over the waste units will be tied together and capped as a single, mounded disposal unit by a continuous final cover (Figure 1.6).

The barrier characteristics of the composite final cover (CFC) must at least match those of the base composite liner. The proposed CFC shall contain the following components from top to bottom:

- 12-inch topsoil layer
- 12-inch frost protection layer
- Geotextile filter fabric
- 6-inch gravel drainage layer
- Geotextile filter fabric
- 30-mil PVC geomembrane
- Geosynthetic clay liner
- Geotextile filter fabric
- 6-inch gravel gas venting layer
- Geotextile filter fabric
- 12-inch Intermediate soil cover over waste

Figure 1.6: Final Contour Plan
(From: WCEC Environmental Consultants, BAC Disposal Landfill Application, 2013)



The top and side slopes of the intermediate cover surface will be smoothed prior to installation of the final cap. The final landfill cover will be installed according to the manufacturer's guidelines for each geosynthetic component and tested for conformance with the design. The PVC geomembrane used in the cap design will be installed in direct and uniform contact with the GCL component to form a composite barrier that functions like the liner system in the base of the landfill.

According to the submitted Closure Plan, the landfill final elevation will not be more than 30 feet above the surrounding grade. The composite final cover contours will attain an 8.5-percent average grade from north to south, with maximum side slopes not to exceed a 5:1 grade. The need for storm water drainage benches will be evaluated prior to construction of the final cover. The topsoil will be fertilized and seeded according to recommendations by the United States Department of Agriculture's Natural Resources Conservation Service. Construction quality assurance and quality control will be maintained during final cover construction according to all project plans approved by DEQ.

Post-Closure Care — The final cover will be monitored periodically for drainage performance, erosion, and vegetative cover to ensure successful performance of the cap through the 30-year post-closure care period. The effectiveness and maintenance of the storm water control system will also be monitored. Repairs to the storm water control system and the cap will be made as necessary.

<u>Landfill Operations</u>:
The facility will be operated as a private landfill. Facility operations will follow an Operations and Maintenance (O&M) Plan approved by DEQ and on conditions imposed on the original license. The facility must comply with the requirements of the Solid Waste Management Act and associated administrative rules, including the

payment of fees and the annual application for renewal. Failure to operate the facility according to these requirements could result in enforcement actions, license revocation, or denial of an application for renewal.

Personnel —The day-to-day administration and operation of the landfill will be the responsibility of the applicant and the facility manager. The facility will be staffed by one to three full-time employees. Additional personnel will be added as needed. Site personnel will inspect incoming loads, review incoming waste load records, operate landfill equipment, and apply the necessary soil cover.

Operating Hours — The facility will be open from 8:00 a.m. to 5:00 p.m. seven days per week.

Access Control — The site is located approximately 5 miles south of Outlook and will be accessed from Montana Highway 374. The entrance into the facility will be through a gated entry road located on the east side of the highway that leads directly to the scale and facility office. A sign will be installed at the facility entrance that indicates the hours of operation, facility contact information, and the types of acceptable wastes. The site will be fenced and gated, and the gate will be locked when the facility is closed.

Acceptable Wastes — The BAC Disposal Landfill will accept non-hazardous solid waste generated by oil and gas exploration and production activities and non-hazardous petroleum hydrocarbon contaminated soils generated from spills and tank removals. These wastes are exempt from regulation as hazardous wastes by 40 CFR 261.4(b)(5) of the Resource Conservation and Recovery Act and are therefore regulated as solid waste. No free liquids will be accepted for disposal. The incoming wastes will have been solidified, typically with fly ash and scoria, at the drill site before being loaded and transported to the disposal facility. During transportation, these wastes may take on the physical appearance of mud from the vibration of the trailer on road surfaces as the heavy particles will tend to settle to the bottom of the trailer and the finer particles rise to the surface. All incoming loads will be inspected by the landfill operator. Observations of free liquids can be made by visual observation at the gate or by performing the paint filter liquids test at the laboratory. This fine mud-like component will require additional solidification prior to disposal if free liquids are observed. The facility will maintain a stockpile of soil and/or ash and scoria to solidify incoming loads as necessary.

The oilfield wastes may include naturally-occurring radioactive materials (NORM) and technologically-enhanced, naturally-occurring radioactive materials (TENORM). DEQ's NORM fact sheet is included as Appendix A. The facility is restricted to accepting and disposing of wastes containing a maximum NORM/TENORM concentration of 30 picocuries per gram (pCi/gm), no more than 50,000 parts per million (ppm) total petroleum hydrocarbons, and may not contain free liquids.

The landfill operator will monitor each load of incoming wastes for radiation activity levels. If the results of radiation monitoring at the scale indicate that radiation levels in the waste delivered to the site exceeds twice the natural background concentration at the landfill, or if hazardous wastes are discovered, the facility will reject the load and instruct the customer to dispose of it at an appropriate facility. The facility operator will notify DEQ's Solid Waste Program within 24-hours when prohibited wastes are discovered at the facility or incoming loads are rejected during the on-site waste screening activities.

Landfill Equipment — The equipment used at the landfill will include:

- A dozer to consolidate the waste and apply daily soil cover;
- A loader; and,
- A sheeps-footed soil compactor.

Daily Landfill Operations — The facility will be accessed only by waste generators and haulers. The facility will not be open to the general public. The landfill operator will inspect all incoming waste loads and associated waste characterization information to ensure all wastes meet the criteria for disposal. All incoming waste loads will be directed to the scale for weighing and then to a staging area for load inspection to ensure there are no prohibited wastes or free liquids and to perform the paperwork evaluation and radiation monitoring.

The vehicles will then be directed to the landfill for unloading once the load inspection has been completed. Empty vehicles will be directed back to the scale to weigh out before departing the facility. At the working face, the landfill operator will also inspect each load as it is unloaded to ensure prohibited wastes are not deposited. Any non-acceptable waste discovered by the equipment operators at the working face will be segregated from the working face, and either tarped or loaded into waste containers. Such wastes will then be removed from the site by a qualified consultant for proper disposal within seven days of receipt.

The wastes will be compacted into 12-in layers to construct 10-ft waste lifts stacked from the bottom upwards that will merge laterally during fill operations. The temporary internal berms will be removed between Phases as the waste fill entirely covers the joined base liner and the phased unit operations merge laterally. Each 10-ft lift will encompass an area approximately 300 ft x 200 ft and will be filled towards the landfill toe on the south end of each phase. Waste filter socks, plastic pit liners, sorbent pads, and other blowable wastes will be disposed of in a separate area within the disposal unit. These wastes will will be covered with at least 6 inches of soil or drill cuttings at the end of the day on which they are received. The waste drill cuttings and produced sands will be covered with at least 6 inches of cover soil on a quarterly basis, or as each 10-ft lift is completed, whichever is sooner.

Waste Disposal Capacity — The proposed landfill will be developed in three phases, each phase consisting of one landfill unit. The total waste landfill capacity is 1,085,600 yds^3. The Phase I unit will provide for the disposal of 181,700 yds^3 of waste; Phases II will provide for the disposal of 311,300 yds^3 of waste; Phase III will provide for the disposal of 592,600 yds^3 of waste. The total projected landfill life is 15 years.

Soils Excavation and Budget — Excavation for construction of the landfill units will progress in three phases. Table 1.2 provides the details of the proposed design volumes and soil balance for each of the three phases and for the landfill in total. Approximately 132,000 yds^3 of topsoil and subgrade material will be excavated for Phase I; 54,000 yds^3 of topsoil and subgrade material will be excavated for Phase II; 114,000 yds^3 of topsoil and subgrade material will be excavated for Phase III. In total, the proposed landfill consists of a designed total liner area of 14.58 acres with a 300,000 yds^3 total cut volume. The existing topsoil, approximately 35,000 yds^3, will be segregated for use as final cover. Ultimately, approximately 251,200 yds^3 of soil will be used for daily, intermediate, and final cover, leaving a net soil surplus of approximately 48,800 yds^3.

Severe Weather Operations — The facility will maintain access for disposal at the facility during wet or otherwise stormy weather by using additional gravel on roads when necessary.

Litter Control — A minimum of six inches of daily cover is required over empty bags, filter socks, plastic pit liners, sorbent pads, or other incidental daily waste from workers at the facility. These blowable wastes will be placed in a separate area within the active disposal unit and covered at the end of the working day.

Table 1.2: Design Volume and Soil Balance

(From: WCEC Environmental Consultants, BAC Disposal Landfill Application, 2013)

LANDFILL AREA	Net Fill (CY)	Net Cut	Liner area (Acres)	2D Area (SF)	Topsoil*	Subgrade Cut	Cover material	Waste Volume	Fill**	Soil*** Stockpiles	Valley Fill	N/E Stockpiles
N & E Stockpiles				280,000	5,200							
Phase I	207,000	132,000	5.51	345,000	12,800	119,200	25,300	181,700	119,200	137,200	110,000	27,200
Phase II	357,000	54,000	3.51	164,000	6,100	47,900	45,700	311,300	47,900	165,900	110,000	55,900
Phase III	715,000	114,000	5.56	293,500	10,900	103,100	122,400	592,600	103,100	234,200	110,000	124,200
Final Cover					-25,200		37,800			111,800	110,000	1,800
TOTALS	1,279,000	300,000	14.58		9,800	270,200	231,200	1,085,600	270,200	48,800	48,800	

Cover material estimated using a fill rate of 200 - 250 yards/day
All units reported in Cubic Yards
*North & East Stockpiles have 6" of cut for topsoil. Phases I, II, & III have 12" of cut for topsoil
**Fill = Subgrade Cut
***Soil Stockpiles = Net cut from previous phase(s) + Topsoil from North & East stockpile - Cover from previous phase
Note: Using native cut for protective layer over liner (1' on the bottom, and 2' on the sides) will require ~31,500 CY.
Approximately 35,000 additional cubic yards can be generated if necessary by cutting the surrounding area within the permitted landfill boundary

Leachate Control — Leachate will be captured in the leachate collection system. Leachate levels in the collection sump will be regularly monitored to maintain less than 12 inches of depth over the liner. A leachate collection sump pump, installed into the lower perforated segment of the south-slope riser pipe, will be used to remove the leachate accumulated in the sump before it exceeds the maximum depth allowed. Leachate will be pumped to the leachate pond for evaporation. The facility will maintain records of the depth, volume, and analytical results of leachate generated.

Storm water control — The facility will follow erosion, drainage control, and sediment Best Management Practices (BMP's) to control storm water run-on and run-off. The facility design includes the construction of berms and ditches to prevent storm water run-on from entering the facility. Within the facility, ditches, swales and berms will be constructed around the perimeter of the disposal unit to divert storm water away from the active landfill unit towards the natural surface discharge areas located on the southern end of the facility. The design also includes the construction of a storm water detention pond designed to collect and retain the 561,000 gallons of water and sediments generated by runoff after a storm event. Gravel armor, fiber matte, straw bales, vegetation, road culverts and other similar features will be used in conjunction with the ditches, swales, and berms to reduce the suspended sediment load conveyed to the storm water pond. The pond will function to contain a surge of storm water generated from an intense rainfall or snowmelt event, retain the suspended sediments that would otherwise be contained in storm water runoff, and then if necessary, discharge via the controlled release of the collected water slowly to minimize the downstream impact of storm-induced flooding.

The storm water that accumulates outside the active portion of the landfill in the northwest corner and along the west side of the waste disposal units will be directed to the storm water detention pond via on-site constructed swales and ditches. Culverts will be installed where necessary for road crossings or to allow for other operational functions. A General Construction Storm Water Permit will be obtained from DEQ's Water Protection Bureau prior to landfill construction activities.

The facility design also includes berms and swales to divert and prevent storm water runoff from entering the active portion of the landfill from upgradient areas. A series of temporary 2-ft high by 3-ft wide berms will be constructed in the active landfill unit to separate the leachate from storm water at the eastern margins of each landfill unit. The storm water collected on the open liner that does not contact waste and the runoff from intermediate cover areas on interim slopes in the active disposal unit will be pumped to the storm water detention pond. The locations of the temporary berms in the active landfill unit will be adjusted as filling in the unit progress. Storm water that contacts waste is considered leachate; all leachate will be captured by the leachate collection system.

The BMP's, including the establishment and maintenance of vegetation on closed areas as well as on the soil stockpiles, will be implemented as necessary. Areas receiving final cover will be contoured for positive drainage so that surface runoff will be routed away from the active disposal area. Runoff from fully re-vegetated and closed areas of the landfill final cover may discharge naturally off-site.

Contingency Planning —The facility operator will notify DEQ's Solid Waste Program within 24-hours when prohibited wastes are discovered at the facility or incoming loads are rejected during the on-site waste screening activities. Flammable wastes are prohibited at the landfill.

Financial Assurance – In accordance with ARM 17.50.540, all Class II landfills must provide and maintain a Financial Assurance (FA) mechanism to cover costs associated with facility closure and post-closure care. A separate FA mechanism in support of corrective action is necessary if the facility has entered into corrective action. Financial assurance ensures that work associated with facility closure is completed in the event the operator cannot or will not do so on his own accord. Financial assurance is required for the BAC Disposal Landfill. The amount of FA required is based upon the proposed maximum costs associated with third-party closure of the maximum exposed landfill area and post-closure care. The current total cost for FA is $4,166,096, and includes projected closure costs of $3,050,260 at the end of operations, and $1,115,836 for the

30-year post-closure care period. The proposed FA mechanism consists of a trust fund that will be funded prior to placement of waste with a minimum $277,740 contribution. This same payment is required annually thereafter based on projected 15-yr remaining life until closure. DEQ will be the fund beneficiary and control all release of money from the trust fund. The facility will update the FA cost estimates and payments to the trust fund on an annual basis to ensure that the trust fund is adequately funded.

SECTION 2.0 – ALTERNATIVES CONSIDERED:

The following provides a description of reasonable alternatives whenever alternatives are reasonably available and prudent to consider:
A decision by DEQ is triggered when the applicant completes the application for licensure of the proposed activity at the proposed location. The applicants however, may at any time choose to withdraw the application. This would result in DEQ selecting the "no action" alternative, because a DEQ decision would not be necessary. If the applicant withdraws the application, the applicant could seek to locate a similar facility elsewhere.

Alternative A: The "no action" alternative. If this alternative is selected, a final decision by DEQ will not be required because the applicant will have chosen to withdraw the application for licensure of the landfill. By withdrawing the application from consideration by DEQ, the applicant could seek an alternative site for the proposal.

DEQ has not received a request by the applicant to withdraw the application for licensure. Therefore, prior to DEQ's final decision, two other possible alternatives were considered during the preparation of this EA.

Alternative B: The "license application denied" alternative. If this alternative is selected, DEQ will deny the new landfill application because the application failed to meet the minimum requirements of the Solid Waste Management Act and could not continue to be processed as submitted. If denied, the applicant has the option to modify the application for the current site and reapply for licensure, or could locate, investigate, and apply for licensure of another site.

Alternative C: The "license application approved" alternative. If this alternative is selected, DEQ will approve the application and issue a new license establishing the BAC Disposal Landfill facility.

In consideration of these alternatives, the potential environmental effects of Alternative C were evaluated for the proposed project based on the information provided, DEQ research on the site and area surrounding the proposed site, as well as DEQ's site visit. The results of DEQ's evaluation of potential environmental impacts related to the proposed facility are summarized in Section 3.0.

SECTION 3.0: EVALUATION OF POTENTIAL EFFECTS

Tables 3.1 and 3.4 of this section identify and evaluate the potential effects that may occur to human health and the environment if the site for the BAC Disposal Landfill facility is approved. The discussion of the potential impacts only includes those resources potentially affected. If there is no effect on a resource, it may not be mentioned in the analysis.

Direct and indirect impacts are those that occur in or near the proposed project area and may extend over time. Often, the distinction between direct and indirect effects is difficult to define and for the purposes of this discussion, direct and indirect impacts are combined.

TABLE 3.1 - IMPACTS TO THE PHYSICAL ENVIRONMENT

PHYSICAL ENVIRONMENT	Major	Moderate	Minor	None	Unknown	Attached
1. Terrestrial and Aquatic Life and Habitats			✔			✔
2. Water Quality, Quantity, and Distribution			✔			✔
3. Geology			✔			✔
4. Soil Quality, Stability, and Moisture			✔			✔
5. Vegetation Cover, Quantity, and Quality			✔			✔
6. Aesthetics				✔		
7. Air Quality				✔		✔
8. Unique, Endangered, Fragile, or Limited Environmental Resources				✔		
9. Historical and Archaeological Sites				✔		
10. Demands on Environmental Resources on Land, Water, Air or Energy				✔		

ANALYSIS OF TABLE 3.1 – POTENTIAL IMPACTS TO THE PHYSICAL ENVIRONMENT

This section evaluates the potential environmental effects that may occur on the physical environment if the proposed facility is approved. The number on each of the underlined resource headings corresponds to a resource listed in the tables. Generally, only those resources potentially affected by the proposal are discussed. Therefore, if there is no effect on a resource, it may not be discussed.

1.0 Terrestrial and Aquatic Life and Habitats

The site for the proposed BAC Disposal Landfill is located in the steppe, or shortgrass prairie, ecosystem of northeastern Montana. The steppe ecosystem consists mainly of numerous species of short grasses that typically grow in sparsely distributed bunches. Scattered shrubs and low trees may populate the steppe, but all gradations of cover are also present, from semidesert (only 10-30% cover) to plains woodland. Because ground cover is generally sparse, large areas of soil are often exposed. The semi-desert shrubs are usually sagebrush and juniper. The natural vegetative cover is more continuous in the glaciated plains north of the Missouri River in the region surrounding the site.

Wildlife forage and habitat is typical of the grassland steppe found in the area. Transient populations of grazing large game mostly include pronghorn antelope, mule deer, white-tailed deer, and possibly elk. Wandering predators like the coyote and red fox may occasionally inhabit the surrounding rangeland. Permanent residence by burrowing small mammals like hares, jackrabbits, rodents; reptiles like turtles and snakes; frequent residence by various avian species including waterfowl, crows, ravens, and opportunist raptors like eagles, merlins, falcons, and burrowing owls are more likely.

The primary impact anticipated due to the construction and operation of the landfill will be the displacement of terrestrial species. The impacts of landfill construction and operation will be minor due to the abundance of surrounding habitat. Further, compliance with good operational practices and the lack of any significant putrescible wastes will eliminate scavenging gulls, crows, ravens, or birds of prey. The attraction of nuisance insects and disease vectors, such as mosquitoes and flies will likewise be eliminated.

Loss of the 44.2-acre proposed facility as wildlife habitat will not be considered critical therefore, as it is not a unique or rare wildlife environment because the tract is currently dominated by wheat cropland with rangeland along the margins to the south and east. Due to the sparse development surrounding the proposed site, there is adequate acreage of similar habitat available in the vicinity to accommodate any terrestrial or avian species that may be forced to relocate. After closure, the area will be re-seeded to native plant species typical of the surrounding grassland habitat. Terrestrial species may repopulate the area after facility closure.

There are no wetlands or permanent surface water bodies located on the proposed site. Because no continuously active aquatic systems currently exist within the boundaries of the proposed site, it is unlikely that there is any significant aquatic life or habitat anywhere on the site. Therefore, the impact to aquatic species is negligible. Following construction, lacustrine and riparian habitats may develop as a result of water in the storm water detention pond. When that occurs, aquatic species or waterfowl might temporarily occupy the pond. However, the storm water pond is an evaporation pond, so any species relying on water in the pond would relocate as the pond dries up.

A search by the Montana Natural Heritage Program found records of two animal species of concern in the local area surrounding the proposed facility:

Species Subgroup	Scientific Name	Common Name	Family Scientific Name	Family Common Name
Fish (Actinopterygii)	Chrosomus eos	Northern Redbelly Dace	Cyprinidae	Minnows
Fish (Actinopterygii)	Margariscus margarita	Pearl Dace	Cyprinidae	Minnows

Designation as a species of concern is not a statutory or regulatory classification. Instead, these designations provide a basis for resource managers and decision-makers to make proactive decisions regarding species conservation. An intensive survey was not performed to verify the presence of, or impact to, terrestrial or avian species at the proposed site. However, there is adequate acreage of similar habitat available in the vicinity of the site to accommodate any species that may be forced to relocate. Consequently, any terrestrial or avian species will likely relocate to the adjacent locations.

2.0 Water Quality, Quantity, and Distribution

Surface Water

Surface water runoff, also known as storm water runoff, is the flow of water that occurs when the excess water generated by rainfall, snowfall, or the melting of snow flows over the land surface. This flow will occur when the soil is saturated, when precipitation falls more quickly that the soil can absorb it, or when a combination of both of these conditions exists. Storm water runoff can cause erosion and may transport sediments some distance from the source depending upon the intensity of the runoff, vegetative cover, soil characteristics, and topography.

The proposed BAC landfill facility design includes general site grading and the construction of storm water diversion ditches and berms along the facility boundary to control storm water. Ditches will divert storm water that falls outside the north and east upgradient side of the active landfill unit towards the natural surface discharge areas located on the southern end of the facility. The design also includes the construction of a storm water detention pond to collect and retain the 561,000 gallons of water and sediments generated by runoff after a storm event. The pond will function to contain a surge of storm water generated from an intense rainfall or snowmelt event, retain the suspended sediments that would otherwise be contained in storm water runoff, and then control the release of the collected water slowly to minimize the downstream impact of storm-induced flooding. If a discharge from the storm water detention pond is necessary, a General Industrial Storm Water Discharge permit will be obtained from DEQ's Water Protection Bureau. The pond is designed with a gated outlet valve and wier to control flows out of the pond. If a discharge occurs, the discharge permit requires that the storm water be sampled for total suspended solids and iron to ensure that the waters that are released are not depositing sediment downstream.

The storm water that accumulates outside the active portion of the landfill in the northwest corner and along the west side of the waste disposal units will be directed to the storm water detention pond via on-site constructed swales and ditches. Culverts will be installed where necessary for road crossings or to allow for other operational functions. A General Construction Storm Water Permit will be obtained from DEQ's Water Protection Bureau prior to landfill construction activities.

The facility design also includes berms and swales to divert and prevent storm water runoff from entering the active portion of the landfill from upgradient areas according to the requirements of ARM 17.50.1109. A series of temporary 2-ft high by 3-ft wide berms will be constructed in the active landfill unit to separate the leachate from storm water at the eastern margins of each landfill unit. The storm water collected on the open liner that does not contact waste and the runoff from intermediate cover areas on interim slopes in the active disposal unit will be pumped to the storm water detention pond. The locations of the temporary berms in the active landfill unit will be adjusted as the landfilling activities in the active unit progress. Storm water that contacts waste is considered leachate; all leachate will be captured by the leachate collection system.

The proposed BAC Disposal Landfill is located approximately 1.5 miles north of Big Muddy Creek. Big Muddy Creek is mapped as an intermittent drainage on the United States Geological Survey (USGS) Archer 1:24,000 quadrangle map south and east of the facility boundary. The two branches of this intermittent channel drain in a southerly direction to Big Muddy Creek. Surface water flows would occur in these drainages only during periods of heavy rainfall or rapid snowmelt. There are no natural springs known within the immediate vicinity of the proposed landfill facility. The Plentywood Creek drainage is located approximately two miles to the northeast over an intervening ridge. There is no possible connection of runoff from the proposed facility to Plentywood Creek.

Storm water detained at the proposed BAC Disposal facility is not expected to overflow the storm water detention pond, enter the central coulee at the southern margin of the facility, flow southward through the breaks, and impact Big Muddy Creek, located 1.5 miles south of the proposed facility. Any such excessive flow would exceed the 25-yr/24-hr storm water pond capacity, and would be extremely diluted by other flows from the adjoining branches of the coulees before reaching Big Muddy Creek. Thus, any impacts to existing nearby aquatic life and habitat due to the proposed facility will likely be very minor.

Due to the small watershed of the downgradient intermittent drainage, the low precipitation the area receives, and the proposed storm water controls, impacts to surface water from the construction and operation of the facility are expected to be minor. The controlled release of storm water from the storm water detention pond will not contain the suspended sediment load that likely occurs during heavy precipitation or snowmelt events. Thus, the quality of the water released from a controlled event is expected to be better than what would be released otherwise.

Groundwater

Throughout northeastern Montana, groundwater typically occurs along the basal contact of glacial till and the underlying Tertiary sediments. On occasion, groundwater resources are found within sand and gravel lenses as perched isolated pockets. Sandstones and coals within the Fort Union formation contain important aquifers that are utilized for drinking water supplies in the area. These aquifers are usually confined above and below by low permeability siltstones and claystones and can therefore be artesian.

The uppermost aquifer present beneath the proposed facility is found in a locally perched water table at approximately 45 to 50 feet below ground surface (bgs). This groundwater table is semi-confined above by glacial till and is confined below by bentonitic claystone of the Lebo Member of the Fort Union formation. Based upon the drill cores collected during the hydrogeological site characterization activities, the perched groundwater table is estimated to be less than 10 feet thick. The perched aquifer is not considered to be potable and is not known to be locally utilized as a drinking water source. The perched aquifer does however produce water suitable for use as stock water.

Groundwater monitoring will be conducted twice per year by the sampling of wells in a DEQ approved groundwater monitoring network. This is to ensure that the liner and leachate collection system are performing as designed. Groundwater monitoring at the facility will ensure any unexpected groundwater impacts are detected and mitigated, and will be performed during the active life of the facility as well as during the 30-year post-closure care period.

The monitoring well network intended for the proposed landfill consists of eight monitoring wells designated as MW1, MW5, MW6, MW8, MW9, MW10, MW11, and MW12 (Figure 3.1). Proposed monitoring well MW12 is located hydraulically upgradient of the landfill area and will provide background groundwater quality data for the site. Monitoring wells MW1, MW5, MW6, MW8, MW9, MW10, and MW11 are located downgradient of the landfill area and will be used to monitor the downgradient groundwater quality in an easterly to southerly direction. Proposed monitoring well MW10 is located downgradient of the leachate and stormwater detention ponds and will be used to identify any changes in groundwater quality that may be attributable to the ponds.

Following installation of the remaining proposed monitoring wells, the first pre-construction baseline sampling event will be conducted prior to initiation of landfill construction activities; a second baseline sampling event will be conducted prior to acceptance of waste at the facility. Routine groundwater monitoring will be conducted on a quarterly basis during the first year of landfill operation, and then on a semiannual basis thereafter. The facility will conduct groundwater monitoring twice per year, during high and low groundwater conditions, to ensure that the liner and leachate collection system are performing as designed. Groundwater monitoring will be performed during the active life of the facility and the 30-year post-closure care period.
The facility will notify DEQ two weeks prior to each sampling event to allow for scheduling of appropriate project oversight visits.

There are few water supply wells located near the proposed landfill. The locally utilized potable groundwater resource is encountered beneath the facility at depths from 250 to 300 feet bgs in sandstone and coal units within the Lebo Member and underlying Tullock Sandstone of the Fort Union formation. Based on a search of the Montana Bureau of Mines and Geology (MBMG) database of recorded existing wells, there are 3 domestic water supply wells, 2 stock wells, and one spring used for stock water within a 1.5-mile radius of the facility (Figure 3.2 and Table 3.2). The nearest well is a stockwell located on the facility property. Groundwater quality samples will be collected from the stock well on an annual basis, coinciding with the low groundwater conditions in the uppermost aquifer, to ensure the deeper aquifer is not impacted by site activities. The deeper drinking water source aquifer in the area is considered to have a low sensitivity to potential contamination from impacts resulting from landfill activities. Sensitivity is defined as the relative ease that contaminants can migrate to source water through the natural materials. The low sensitivity rating is due to the fact that the drinking water aquifer is a confined aquifer that is protected by more than 100 feet of dry, relatively impermeable claystones, mudstones, and sandstones, typical of the Fort Union formation in the area of the facility property. Based on the facility design and operational controls, coupled with the predicted low levels of leachate production and characteristics of the glacial till, the expected impacts to groundwater from facility activities are expected to be negligible.

Figure 3.1: Location of Existing (green) and Proposed Monitoring Wells (blue)

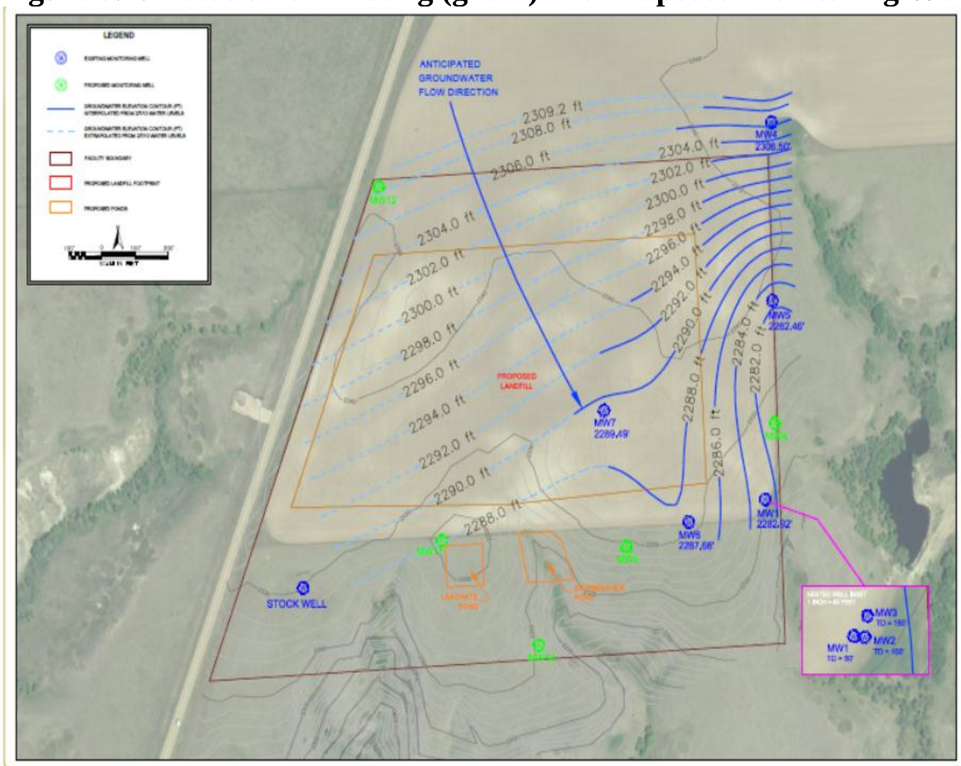


Figure 3.2: Location of Water Supply Wells in a 1.5 mile radius of the site (Site location is outlined in red)
Source: Montana Bureau of Mines and Geology

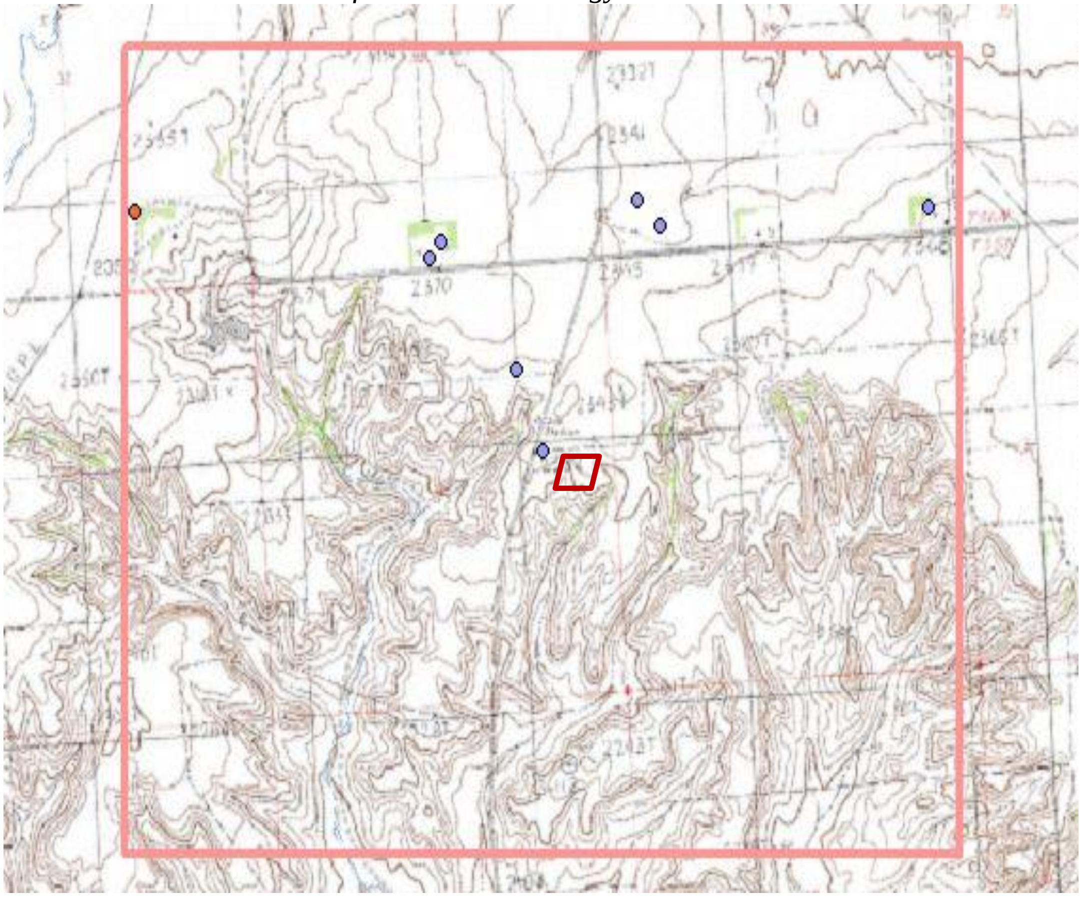


Table 3.2: Summary of supply wells
Source: Montana Bureau of Mines and Geology Ground Water Information Center

Gwic Id	Township	Range	Section	Quarter Section	Type	Total Depth	Static Water Level	Yield (gpm)	Date	Use
46763	35N	53E	4	A	WELL	108	88	3	7/5/1966	STOCKWATER
146952	35N	53E	4	ADC	WELL	350	270	10	9/20/1993	STOCKWATER
243979	35N	53E	8	CC	SPRING		0		5/1/1942	STOCKWATER
46766	35N	53E	8	CC	WELL	65	6	5	5/1/1942	DOMESTIC
46765	35N	53E	8	CC	WELL	65		5	5/1/1942	DOMESTIC
46767	35N	53E	11	DDCD	WELL	518	300	10	1/1/1910	DOMESTIC

3.0 Geology

Northeastern Montana geology generally consists of alluvium and glacial deposits that overlie the bedrock of the Fort Union Formation. Alluvium is derived from unconsolidated sediments that have been eroded and redeposited by water in a non-marine setting and is made up of a variety of fine to coarse-grained sand, silt, clay, and gravel. The alluvium is primarily present at the surface near Plentywood Creek and its major tributaries.

The continental glaciers that extended into northeastern Montana left behind deposits of glacial sediments known as glacial till and glacial outwash. Glacial till is the unsorted sediment left behind by the ice, while outwash are the sediments deposited by running water coming off the melting glacier. In some places, the glacial sediments deposited by the melting ice buried the older stream valleys in the area. Dense glacial till makes up the upper 35 to 45 feet of sediments beneath the site.

The glacial deposits are underlain by discontinuous beds of poorly cemented sandstone, shale, clay, and coal of the Fort Union Formation. In Eastern Montana, the Fort Union Formation has been subdivided into (from oldest to youngest) the Tullock, Lebo and Tongue River Members. The bedrock in this part of northeastern Montana lies on the western flank of the Williston Basin, which a large-scale geologic structure centered near Williston, North Dakota. During the formation of the Williston Basin, the Fort Union Formation underwent structural deformation that resulted in the beds dipping in a southeasterly direction in the vicinity of Outlook.

At the site, the dense glacial till is underlain by a gray bentonitic claystone unit belonging to the Lebo Member of the Fort Union formation. The upper 8 to 10 feet of the Lebo Member is weathered and fractured from exposure prior to glacial covering. Based on the geologic cross sections, this weathered portion of the Lebo Member appears to be isolated to the eastern portion of the site. Tongue River sediments are not present beneath the project site, but are found adjacent to the site where they have been preserved on less deeply weathered hilltops.

Landfill Stability

The proposed site is located at the extreme western margin of the Williston Basin, a basin created by tectonic buckling of previously flat lying strata. The strongest local evidence of earthquake activity is observed in the Weldon-Brockton-Froid Fault zone that trends in a northeasterly direction and extends into northwestern North Dakota. This fault zone, however, is located approximately 40 miles south of the facility, and is not expected to impact the facility. Therefore, because the site is not located within 200 feet of a fault that has had displacement during the last 11,000 years (Holocene period), additional landfill design elements related to seismic activity are not required.

4.0 Soil Quality, Stability, and Moisture

The region is comprised of alluvial and glacial deposits underlain by the Tertiary Fort Union Formation. Soils in the vicinity are mostly the Williams Loams.

The soils typically associated with the glacial till parent materials are silty clay type soils and are generally thin and poorly developed. The natural soils at the proposed site include the Lambert-Zahill complex, the Williams loam, and the Williams-Zahill loams. These soils were developed from the glacial tills and alluvium derived from shale and siltstone. The Williams loam is the dominant soil type at the proposed site; the Williams-Zahill loams are the secondary soil type. Key soil properties are summarized in Table 3.3; Figure 3.3 provides a map of the soil types. Although the Williams soils typically produce deep organic horizons, these natural soils, dominant at the site, are poorly developed and contain a higher clay content with a shallow organic soil horizon.

The sixteen test pits that were excavated at the site exposed the glacial till derived soils that exhibited sandy loam and clay loam textures. In addition to the test pits, seven wells and five soil borings were also completed within and around the proposed landfill footprint. The glacial till is uniform across the proposed landfill footprint, and is green-brown, moist to slightly moist with granular to pebble size rock clasts with the occasional cobble to boulder size rock clasts.

Soil cores were collected from four of the test pits. Two 24-inch soil cores were collected from each of the five soil borings; one from the soil horizon representing an elevation immediately below the base of landfill unit, and the other from the soil horizon representing an elevation 20 feet below the base of the landfill unit. These core samples were submitted for laboratory testing to measure the average vertical hydraulic conductivity.

Laboratory test results indicate that the soils are generally silty clay to clay loam with specific percentages ranging from: Sand: 7-35.8%; Silt: 32.3-56.9%; Clay: 21.2-40.4%. The measured hydraulic conductivities ranged from $1.0x10^{-8}$ cm/sec to $7.3x10^{-9}$ cm/sec. This range is typical for glacial till and silts.

The results of the site hydrogeological and soils characterization activities indicate that the foundation soils at the site have relatively high strength and low compressibility characteristics. Since the foundation soil is well above the saturated uppermost aquifer, most of the settlement/heave is elastic and will occur as loads are applied or removed. The maximum range of heave during landfill construction is expected to be in the range of 1 to 3 inches, or less. Primary and secondary settlements are only of significance in fine-grained soils below the saturated zone and are therefore not likely to occur at the site.

Table 3.3: Summary of Soil Properties
Source: USDA-NRCS, Web Soil Survey, Sheridan County, Montana

Soil Type	Map Key	Depth profile	Drainage	Permeability	Available Water Capacity	Erosion Hazard	Soil Compaction Resistance
Lambert-Zahill complex, 20 to 50 percent slopes	LcF	0 to 60 inches: Silty clay loam	Well Drained	Moderately Low – Moderately High	High	Medium – Medium High	Low Resistance
Williams loam, undulating	WmB	0 to 6 inches: Loam. 6 to 60 inches: Clay loam	Well Drained	Moderately Low – Moderately High	High	Medium	Low Resistance
Williams-Zahill loams, gently rolling	WzC	Shallow	Well Drained	Moderately Low – Moderately High	High	Medium	Low Resistance

During the construction and operations of the landfill, the native soils and subsurface materials in the fill area will be removed and stockpiled on site for the construction of the liner cushion soil layer and storm water diversion berms. The stockpiled soil may also be utilized as quarterly and final cover soil. Following closure of the landfill, the segregated top soil will be re-placed over the final cover, and then revegetated to restore the site to pre-landfilling conditions.

Figure 3.1: Map of Soil Types
Source: USDA-NRCS, Web Soil Survey, Sheridan County, Montana

Key: **LcF**—Lambert-Zahill complex, 20 to 50 percent slopes; **WmB**—Williams loam, undulating; **WzC**—Williams-Zahill loams, gently rolling

5.0 <u>Vegetation Cover, Quantity, and Quality</u>

The vegetation community in and around the proposed BAC Disposal Landfill is mostly steppe type, also called shortgrass prairie, that contains lesser semi-desert type vegetation. Steppe vegetation consists mainly of numerous species of short grasses that typically grow in sparsely distributed bunches. Scattered shrubs and low trees, sagebrush and juniper, may populate the steppe, but all gradations of cover are also present, from semidesert (only 10-30% cover) to plains woodland. Because ground cover is generally sparse, large areas of soil are often exposed.

A search by the Montana Natural Heritage Program found no records of vascular plant species of concern in the area surrounding the site. During construction and operation, most plant species will be removed from the proposed 14.58-acre disposal unit. The topsoil removed during site development will be used to construct a berm on the northeast corner of the site within the licensed boundary. This berm will be seeded to prevent erosion of the stockpiled soils. The additional earthen-materials removed during excavation of each landfill unit will be stockpiled in the area of the subsequent unit and will be used as-needed for daily, intermediate, and final soil cover.

As portions of the landfill are filled to their final grade, they will be covered with an earthen final cover and topsoil. This cap and other disturbed areas will then be re-seeded with native plant species appropriate to the area as recommended by the Natural Resource Conservation Service at the time of closure. The variation of native plant species in reseeded areas will be enhanced as natural succession progresses during the 30-year post-closure period.

Revegetation of the disturbed areas upon closure will return the site to grass land suitable for wildlife habitat and livestock grazing. In order to assure the integrity of the landfill cover re-vegetation process, grazing will initially be restricted to allow the cover vegetation to become fully established. Grazing on the final cover will later be monitored to prevent overgrazing. Agricultural activity over the closed landfill units will also be restricted to approved activities.

Consequently, the overall permanent impacts of the landfill construction, operation, and closure activities on the original prairie vegetation will be relatively minor, being largely isolated to the landfill units. Because the final topsoil will be partly derived from the stockpiles of naturally developed topsoil on site south of the tilled northerly area, the latent seed bank will provide a source to mitigate impacts on some natural species in all reseeded areas. The most troublesome local noxious weeds are primarily thistle (both Canadian and Russian) and field bindweed. Noxious weeds throughout the facility will be controlled by spraying with effective herbicides, an approach that has been successful for years in the tilled areas where the facility would be located.

7.0 Air Quality

Air quality concerns related to landfills are frequently associated with fugitive dust emissions from landfill traffic, construction activities, and day-to-day facility operations. Traffic within the facility due to these activities will cause an increase in the levels of airborne dust during the dry months of the year relative to the current on-site farming activities. As this occurs, dust control measures on the interior roads such as applying a dust palliative or water will lessen the impact. Construction of new landfill cells will cause an increase in internal landfill traffic to create an increase in airborne dust during the period of excavation and construction. Since the construction periods will be short in relation to the operating life of the facility, these effects will be minor. If dust from construction becomes a problem, dust control measures, such as wetting the surface before working on it, will be initiated as is typical for earthwork. Normal operational traffic on the site could cause a minor increase of suspended dust particles in the air during the summer months. If this becomes a problem, it will be mitigated by adequate dust control measures on the interior roads such as applying a dust palliative or water. The excavation and placement of cover material could increase the dust in the air. If it becomes a problem, the cover material will be wetted prior to its placement so that the net effect will be minor. All long-term soil stockpiles will be seeded to prevent erosion and airborne dust.

TABLE 3.4 - IMPACTS TO THE HUMAN ENVIRONMENT

HUMAN ENVIRONMENT	Major	Moderate	Minor	None	Unknown	Attached
1. SOCIAL STRUCTURES & MORES				✔		
2. CULTURAL UNIQUENESS & DIVERSITY				✔		✔
3. DENSITY & DISTRIBUTION OF POPULATION & HOUSING				✔		
4. HUMAN HEALTH & SAFETY				✔		
5. COMMUNITY & PERSONAL INCOME				✔		
6. QUANTITY & DISTRIBUTION OF EMPLOYMENT			✔			✔
7. LOCAL & STATE TAX BASE REVENUES			✔			✔
8. DEMAND FOR GOVERNMENT SERVICES			✔			✔
9. INDUSTRIAL, COMMERCIAL, & AGRICULTURAL ACTIVITIES & PRODUCTION			✔			✔
10. ACCESS TO & QUALITY OF RECREATIONAL & WILDERNESS ACTIVITIES				✔		
11. LOCALLY ADOPTED ENVIRONMENTAL PLANS & GOALS				✔		
12. TRANSPORTATION			✔			✔

ANALYSIS OF TABLE 3.3 - POTENTIAL IMPACTS ON HUMAN ENVIRONMENT

This section evaluates the potential environmental effects that may occur on the human environment if the proposed facility is approved. The number on each of the underlined resource headings corresponds to a resource listed in the tables. Generally, only those resources potentially affected by the proposal are discussed. Therefore, if there is no effect on a resource, it may not be discussed.

2. <u>Cultural Uniqueness and Diversity</u>

A cultural resource file search was conducted for Sections 3 and 4, T33N, R53E. The results of the file search indicated there have been no previously recorded sites within the area. Based upon previous ground disturbances in the area associated with agricultural activities, the State Historic Preservation Office (SHPO) determined that there is a low likelihood cultural properties will be impacted and therefore a cultural resource inventory is unwarranted. However, should cultural materials be inadvertently discovered during proposed excavation of the site, the SHPO requested they be contacted and the site investigated for additional cultural resources.

6. <u>Quantity and Distribution of Employment</u>

During the construction and operational phases of the landfill there could be a minor increase in local employment due to the need for contractors, site operators, and associated support.

7. <u>Local and State Tax Base and Tax Revenue</u>

Since there will likely be a few additional workers hired during the construction phases of the proposed landfill, construction of the proposed facility could have a minor positive effect on the local tax base. Annual income from the disposal fees could also have a minor positive effect relative to the income from farming on the parcel.

8. <u>Demands for Government Services</u>

The potential impact of the proposed facility licensure is expected to be minor. The Sheridan County Environmental Health Department and DEQ’s Solid Waste Section will perform inspections of the site both during and after construction, a routine activity. During the construction phases, there may be a slight increase in traffic on the roads leading to the landfill, but the impact to local law enforcement and road maintenance crews is expected to be minor because there will only be a few additional contractors involved over a relatively short time period.

During facility operations, the Sheridan County Sanitarian and DEQ’s Solid Waste Section will perform inspections and provide compliance assistance while the facility is operational. The County and State road department maintenance crews may be required to perform additional road maintenance after licensure.

The Sheridan County Sanitarian, the Montana Department of Transportation’s (MDT) Motor Carrier Services Division, and DEQ’s Solid Waste Section and Enforcement Division may also be called upon to respond to complaints and spills on the County and State highways. Spills of any size may be reported to the Sheridan County Sanitarian; spills greater than 25 gallons must be reported to DEQ’s Spill Hotline. The clean-up of spills that occur during transportation will be overseen by the Sheridan County Sanitarian and/or DEQ’s Enforcement Division, and must be completed in accordance with the state and/or federal requirements. Individual haulers and hauling contractors are completely liable for expenses and proper clean-up related to accidental spills resulting from hauling materials to and from the facility.

9. Industrial, Commercial, and Agricultural Activities and Production

Construction of the proposed facility will cause a minor increase in the industrial activity of the area during construction due to the need for contractors and associated materials and machinery repairs.

Agricultural activities in the area consist primarily of farming and livestock grazing. lands. Local ranches raise mostly cows and calves, cultivate hay, and manage winter pasture. Wide open areas of rangeland provide excellent quality summer grass for an extensive livestock industry. Grazing dominates in areas of steeper slopes. Dryland farming of grain crops predominates in most upland areas. Recently the land within the proposed facility boundary has been managed for wheat cropland.

Since the area immediately surrounding the proposed site is sparsely developed agricultural and pasture land, no additional industrial or commercial impacts are anticipated. The relatively small area of land occupied by the facility would have almost no effect on the vast agricultural and rangeland surrounding the site.

12. Transportation

The BAC Disposal Landfill site will be accessed from Montana Secondary Highway 374. The highway is currently utilized by local area farmers and ranchers for transporting loaded trucks full of crops and livestock. Truck traffic on these roads will likely increase, but the road currently supports loaded trucks of agricultural products of equal weights. The additional truck traffic resulting from operation of the facility may result in more frequent road maintenance activities due to additional vehicle use. The Federal Department of Transportation and MDT have weight limits for transportation on Federal and State highways and roads. The Sheridan County Road Department has jurisdiction over local county roads, including the establishment of speed and load limits. The increased truck traffic will cause additional wear and tear on the highway that will result in a potential minor increase in the frequency of road maintenance activities by the Sheridan County Road Department and the Montana Department of Transportation.

SECTION 4.0 CONCLUSIONS AND RECOMMENDATIONS

A listing and appropriate evaluation of mitigation, stipulations and other controls enforceable by the agency or another government agency:

The proposed licensure of the BAC Disposal Landfill will meet the minimum requirements of the Montana Solid Waste Management Act and administrative rules regulating solid waste disposal. Adherence to these DEQ licensing criteria will mitigate the potential for harmful releases and impacts to human health and the environment by the proposed facility. Along with standard criteria for the Solid Waste Management System License as issued by DEQ, and as validated by the local Sheridan County Health Officer, the licensee must adhere to the following specific license conditions:

(1) The BAC Disposal Landfill will accept only RCRA-exempt non-hazardous solid waste generated by oil and gas exploration and production activities.
(2) The concentrations of Ra-226 and Ra-228 in solid wastes managed at the facility may not exceed a cumulative total of 30 picocuries per gram.
(3) Results of radiation monitoring for wastes delivered to the site may not exceed 2-times the natural background concentration at the landfill.
(4) The facility operator will notify DEQ within 24-hours when prohibited wastes are discovered or loads are rejected during waste screening activities at the facility.
(5) Drill cuttings and produced sands must be covered at least quarterly with a minimum of 6-inches of soil, or upon completion of a 10-ft lift.
(6) Dust emissions from the site must be controlled.
(7) Site access must be controlled at all times.

Recommendation:

DEQ recommendation is to distribute the EA to adjacent landowners and interested persons to satisfy the public notification and participation requirements of MEPA.

Findings:

DEQ has determined that the proposed site, located on rural, private property, will have a minor impact on the surroundings. The site will be fenced, access will be controlled at all times, and all landfill activities will be performed according to DEQ approved Operation and Maintenance Plan. Site activities will be verified by periodic inspections performed by DEQ and/or Sheridan County personnel to ensure that the potential risk of adverse effects on human health and the environment resulting from operation of the facility are minimized. As a result, DEQ finds that an EA is the appropriate level of analysis and an Environmental Impact Statement is not needed.

If an EIS is needed, and if appropriate, explain the reasons for preparing the EA:

DEQ finds that an Environmental Impact Statement (EIS) is not necessary due to the mitigating factors provided by the solid waste rules and the applicant’s proposal for licensure of the BAC Disposal Landfill at the selected location. Consequently, the combined effect of all such factors at the site will ensure to a reasonable extent that any potential direct or cumulative impacts to human health and the environment from the proposed landfill are minor.

If an EIS is not required, explain why the EA is an appropriate level of analysis:

DEQ finds that construction, operation, and post-closure care of the proposed BAC Disposal Landfill will not significantly affect the quality of the human environment both within and surrounding the local area. The proposed project will be reasonably expected to have minor impacts on terrestrial life, vegetation and other aspects of the physical and human environment relative to the current use of the site. However, the site is located in a sparsely populated area used for agricultural purposes. Based upon the facility design and operational controls, the sparse population, and the separation of the waste from groundwater, there are no anticipated impacts to groundwater resources from the disposal of the special wastes. Therefore, an EA is the appropriate document to address the potentially minor impacts of the proposed licensure of the Oaks Disposal Landfill.

Other groups or agencies contacted or which may have overlapping jurisdiction:

Montana Natural Heritage Program
State of Montana Historic Preservation Office
U.S. Geological Survey
Montana Bureau of Mines and Geology
U.S. Department of Agriculture - Natural Resource Conservation Service

Individuals or groups contributing to this EA:

Natural Heritage Program
State Historic Preservation Office
West Central Environmental Consultants
U.S. Geological Survey
Montana Bureau of Mines and Geology
U.S. Department of Agriculture - Natural Resource Conservation Service

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